CHAPTER 9

Solid Waste Management
Privatization Procedural Manual

# CONSTRUCTION AND DEMOLITION DEBRIS MANAGEMENT


SOLID WASTE TECHNICAL ASSISTANCE

Ministry of State for Environmental Affairs

U.S. Agency for International Development

Egyptian Environmental Policy Program

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# INTRODUCTION

Egypt has embarked on an aggressive program to upgrade its management of solid waste nationwide. The program includes the privatization of solid waste collection, recycling, composting, and/or disposal on a governorate-by-governorate basis. Most programs have focused on the residential, commercial, industrial, and/or medical waste streams. However, privatization can also help governorates better manage construction and demolition debris (C&D) collection, recycling, and disposal.

*Privatization can help governorates better manage construction and demolition debris.*

Construction and demolition debris consists of waste material generated from construction, remodeling, and/or demolition of buildings and other structures. It also includes land clearing and grubbing wastes. Unlike municipal solid waste (MSW), C&D largely consists of inert waste, containing a significant amount of soil, concrete, and masonry sand. Construction projects can and do range in size from small remodeling projects in private residences to gigantic projects such as highway construction, large dams, and bridges. While all of these activities are regulated under the laws of Egypt, some are clearly outside the responsibility of local government officials responsible for solid waste management. This chapter will not cover the management of C&D debris from huge projects such as highway, dam, and bridge construction.

C&D currently is one of the larger waste streams in Egypt without an effective management system. While some portions of the current C&D collection and disposal system in Egypt are effective, many portions are not. This failure has resulted in the accumulation of significant quantities of waste material on both private and public lands. Many empty lots in Egypt are littered with piles of C&D from construction projects in the surrounding area, and the edges of virtually every road and highway in Egypt are lined with piles of C&D materials.

Because C&D materials and management alternatives are different from typical MSW, separate systems have been developed to manage C&D. These systems have generally been managed as part of the permitting and development of the building industry rather than as solid waste programs.

This chapter is intended as a guide for governorate officials involved in planning for the privatization of C&D management.

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*Planning for a C&D Management Program can be broken down into the following six steps:*

*Step 1: Define Existing Construction and Demolition Debris Management Practices.*
*Step 2: Identify and Assess C&D Management Options.*
*Step 3: Compile Findings in an Assessment Report.*
*Step 4: Evaluate C&D Program Scenarios.*
*Step 5: Select Preferred C&D Program.*
*Step 6: Implement the Selected Program.*

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# STEP 1:

# DEFINE EXISTING CONSTRUCTION AND DEMOLITION DEBRIS MANAGEMENT PRACTICES

Existing C&D management practices must be studied and understood to determine where improvements or changes are needed to improve management practices. This step provides an organized system to help the user carefully examine and understand each of these framework components, and consists of the following actions:

- Review Legal, Regulatory, and Policy Framework.
- Determine Planning Area Demographics and Physical Characteristics.
- Determine C&D Waste Stream Characteristics.
- Identify Current C&D Collection Practices.
- Identify Current C&D Disposal Practices.
- Identify Current C&D Enforcement Methods.
- Assess Accumulated C&D Waste.

## Review Legal, Regulatory, and Policy Framework

Egypt's overall current solid waste regulatory and policy framework is discussed in Chapter 2. In addition, programs for the management of C&D have been developed within the construction permitting and development regulatory system under the Ministry of Housing. Specific aspects of these laws and regulations, and sources of policy information that are directly applicable to C&D, are presented below.

The laws and regulations discussed in Chapter 2 relate primarily to the collection and disposal of municipal solid waste. These laws provide the authority to local governments to implement solid waste programs including collection and disposal of C&D. Law Number 38/1967 and Law 4/1994 prohibit the placement of garbage, waste, or rubbish in places not authorized by the local council. Article 1 of the Executive Rules for Law 38/1967 defines garbage, waste, and rubbish and includes any waste material that, if stored in an undesignated area, would harm the appearance or cleanliness of a city or town. This definition is intended to include C&D.

In addition to the general prohibition on disposal of C&D at unauthorized places in Law 38/1967 and Law 4/1994, Law 140/1956 specifically prohibits the placement of C&D in public ways. Law 38/1967 also requires private landowners to keep their properties free of accumulated debris. Additional laws have provisions that regulate the storage and transportation of waste in general, and specifically C&D. As an example, Law 4/1994 Article 41 requires that C&D be:

- Stored in a manner that does not obstruct.
- Covered, if likely to be dispersed by wind.
- Transported in licensed vehicles.

Law 4/1994 Article 41 also requires that C&D disposal sites be:

- At least 1.5 kilometers from residential areas.
- Below the grade of surrounding areas.
- Leveled, or at grade, after disposal.

Under Law 4/1994, local governments are granted authority to regulate the collection and disposal of C&D. Laws 106/1976 and 101/1996 allow local governments to include the management of C&D through the permits required for construction activities. This law also allows local governments to collect a fee from contractors and owners to, among other things, provide or pay for C&D collection and/or disposal. However, it is usually cheaper for a contractor to haul C&D to an unapproved site near by and forfeit already paid-for disposal services at an approved, but more distant site. Furthermore, existing legislation is not effective because:

**High rates of building construction quickly generate high levels of debris that needs to be managed.**

- Many construction activities occur without a permit.
- There is limited enforcement of these regulations.
- Few local governments provide C&D collection and disposal services.
- The 1 percent building permit fee is usually committed to other services.

A summary of laws and regulations related to C&D storage, transport, and disposal is presented in Table 9.1.

### Table 9.1: LAWS AND REGULATIONS RELATED TO C&D STORAGE, TRANSPORT, AND DISPOSAL

| |
|---|
| Law 38/1967, primary law governing the management of solid waste in Egypt. |
| Law 38/1967, Article 1, prohibits disposal of waste at unauthorized locations. |
| Law 4/1994, generally covers environmental management in Egypt and provides for penalties and enforcement. |
| MOH Decree 134/1968, defines garbage, waste, and rubbish, and includes C&D. |
| MOH Decree 134/1968, Article 3, requires C&D to be hauled in vehicles licensed by the appropriate local government. |
| MOH Decree 134/1968, Article 14, regulates the collection and transport of C&D. |
| Law 4/1994, Article 39, requires all organizations and individuals to secure safe storage or transportation of C&D materials, including wastes from excavations. |
| PM Decree 338/1995, Article 41, includes regulations to implement Law 4/1994; also includes additional regulations regarding the storage and transport of C&D and provides requirements for C&D disposal sites. |
| Law 106/1976 and Law No. 101/1996, allows local governments to collect a fee on construction projects to pay for their services, including C&D collection and disposal. |
| Law 48/1982, prohibits the disposal of solid waste, including C&D, in canals. |
| Law 84/1968, Article 13, prohibits the placement of waste on public ways. |
| Law 140/1956, Article 2, prohibits the placement of C&D on public ways. |

Enforcement of these laws and regulations is primarily a local government responsibility. Local governments are required to authorize disposal sites, to require clean-up of illegally disposed C&D, and to enforce C&D collection and storage requirements. Local governments are also responsible for the permitting and regulation of C&D activities within their jurisdictions.

## Determine Planning Area Demographics and Physical Characteristics

Much of the required information related to planning area demographics and physical characteristics should already be available from the earlier assessment of the overall solid waste management stream described in Chapter 2, but some additional information may be required. Specifically, the C&D assessment requires information on the following:

- Development activities and growth rates within the planning area. It is important to understand whether an area is in an ex-

**Collapsed building waste.**

pansion, revitalization, or contraction phase. If an area is undergoing expansion it will be experiencing significant construction activities. Similarly, if it is in a revitalization phase, significant demolition will occur, followed by construction. If it is in a contraction phase then little construction is expected.

- The type(s) of construction likely to occur in the planning area, and the type of contractors likely to perform these construction activities. This information will help to assess the requirements for C&D regulations, collection service, and disposal facilities. As an example, large contractors will have access to trucks and other equipment and will be able to provide their own C&D collection services. These contractors may only need access to a disposal site. A small contractor or a homeowner may not have access to this type of equipment and thus require both collection and disposal options.

- Roads, highways and other transportation limitations in the planning area. The C&D collection and disposal system will likely require that contractors, individuals, and/or specialized C&D contractors, have access to authorized disposal sites. Criteria should be developed for use in evaluating potential C&D disposal and/or transfer facilities.

- Land use patterns to allow the planner to understand where significant quantities of C&D material are likely to be generated. This will help in selecting locations for C&D disposal and/or transfer facilities.

### *Information needed to effectively plan C&D collection and disposal options:*

- *Population and population densities.*
- *Projected growth rates.*
- *Family size, age, education and income demographics.*
- *Number of residential structures.*
- *Number of residential dwelling units and housing densities.*
- *Number and size of commercial buildings.*
- *Number and size of government/institutional buildings by type (school, hospital, etc.).*
- *Size of planning area in square kilometers ($km^2$).*
- *Traffic patterns and transportation infrastructure.*
- *Land use patterns.*
- *Typical construction practices and materials.*

## Determine C&D Waste Stream Characteristics

To evaluate C&D management alternatives it is necessary to know the physical characteristics and the composition of the C&D waste stream. Accordingly, the next action is to develop waste quantity and composition estimates that are as reliable as possible. In many cases, accurate information needed to estimate quantities of C&D is not available. If actual data is not available on existing C&D quantities and composition, the estimates will have to be based on projected population growth rates and densities.

A planning area's general C&D characteristics vary according to the following:

- Extent of urbanization.
- Income level.
- Degree of industrial and commercial activity.

In previous chapters, the user was provided guidance on collection of data related to the quantity, composition, and density of the general waste stream. The evaluation of various C&D collection, disposal, and recycling alternatives requires similar levels of information; however, the composition of the C&D stream will be significantly different than that of MSW. In addition, in most cases there is not a large existing body of data specifically detailing the composition or quantities of C&D materials. This is especially true with the system in Egypt where private parties are responsible for their own collection and disposal needs for C&D, and where there is minimal enforcement of regulations requiring proper disposal of C&D.

## C&D Composition

To evaluate C&D composition, the data for the total C&D waste stream must be separated into categories. The type of information needed in the recommended categories is shown in Table 9.2.

### Table 9.2: C&D WASTE STREAM CATEGORIES

| Type of Construction | Source of Construction | Material Type (See Table 9.3) | Estimated Quantity of C&D (Tons) | Composition Comments * |
|---|---|---|---|---|
| **New Construction** | Residential | | | |
| | Commercial | | | |
| | Industrial | | | |
| | Public Works | | | |
| **Remodeling Construction** | Residential | | | |
| | Commercial | | | |
| | Industrial | | | |
| | Public Works | | | |
| **Demolition Projects** | Residential | | | |
| | Commercial | | | |
| | Industrial | | | |
| | Public Works | | | |

* Composition comments would include information such as: Residential construction is primarily high-rise concrete and masonry buildings.

The composition of the waste may vary significantly between the categories listed above. It will also vary from area to area depending on typical construction practices. High levels of soil, concrete, and masonry are to be expected in many of the categories shown above in the larger cities in Egypt. This is because the primary method of construction for residential and commercial buildings is concrete and masonry. This type of construction typically requires significant excavations for foundations, with little room on site for regrading and/or using the excavated soils. Industrial construction may also contain these materials but may include more metal. These categories should be assessed to properly evaluate C&D disposal and recycling alternatives. Table 9.3 contains examples of the type of materials that are categorized in the Table 9.2.

Table 9.3 does not include one important characteristic that should be verified for C&D from a particular area. That characteristic is the level of organic materials in the waste. In most areas C&D is composed of primarily non-organic materials such as dirt, rock, sand, masonry, concrete, metal, wood, and roofing materials. If the disposal alternatives are to include inert waste landfills, or certain recycling programs, then the composition of the waste needs to be analyzed or at least reviewed with the inclusion of possible organic materials in the waste stream.

## C&D Quantity

Obtaining accurate data regarding the quantity of C&D can be a difficult task. It is common in many areas of the world, including Egypt, for C&D to be the responsibility of the construction contractor or property owner. It is also common that the few regulations that do exist are not effectively enforced. This leads to improper disposal and therefore is it hard to quantify and develop accurate data.

In 1998, the Governorate of Alexandria estimated that C&D from their governorate amounts to 100 cubic meters ($m^3$) per day. They also estimated that the C&D would weigh, on average, 1,000 kilograms (kg) per $m^3$. Thus the daily generation rate would be 100 metric tons (tonnes). With a population of 3,385,000, this amounts to approximately 0.03 kg per person per day of C&D.

**Debris from demolished brick structure.**

## Table 9.3: TYPICAL C&D COMPOSITION

| Material Type | Examples |
|---|---|
| **Wood** | Forming and framing lumber, stumps, plywood, laminates, scraps, flooring. |
| **Drywall** | Sheetrock, drywall, gypsum, plaster. |
| **Metals** | Pipes, rebar, flashing, steel, aluminum, copper, brass, stainless steel. |
| **Plastic** | Vinyl siding, doors, windows, floor tiles, pipes, packaging. |
| **Roofing** | Asphalt and wood shingles, slate, tile, roofing felt. |
| **Aggregate** | Asphalt, concrete, cinder blocks, rock, earth, soil. |
| **Masonry** | Bricks and decorative blocks. |
| **Glass** | Windows, mirrors, lights. |
| **Other** | Carpeting, fixtures, insulation, ceramic tile. |

In a more detailed analysis performed for the United States Environmental Protection Agency in 1998, Franklin Associates estimated C&D from building-related construction to be 1.3 kg per person per day. Using the Egyptian and the U.S. estimates to calculate the tonnage for a governorate of 4 million people results in a range between 44,000 and 1,900,000 tonnes per year. It is likely that the actual amount in Egypt is somewhere between these estimates. The large range is demonstrative of the lack of accurate data available in Egypt and reinforces the need for careful examination and analysis of the C&D waste stream in each governorate.

Another factor that could impact the amount of C&D in Egypt requiring collection and disposal is the C&D already accumulated on private property, roads, and other public areas. The current practice for disposal of much of the C&D in Egypt is usually one of the following:

- Unwanted materials are dumped in an empty lot.
- Unwanted materials are dumped along side a roadway.
- Unwanted materials are left at the site where they were generated.

**Discarded apartment remodeling materials.**

As a result, there is a huge amount of accumulated C&D that needs to be managed within a new C&D system.

The level of confidence in C&D quantity estimates is not very high at present. This should be recognized when evaluating alternatives. Proposed disposal sites should have adequate capacity to handle more material than anticipated. However, they need not be initially designed to handle the high end of the estimated range. Once a system to properly manage C&D is in place, and C&D regulations, enforcement, and/or contracts are implemented, planners and system operators will gain a better understanding of the actual quantities. Fortunately, most of the alternatives available to handle C&D are not overly sensitive to volume fluctuations.

*As accurate data on the quantity and composition of the C&D waste stream becomes more available, it will become easier to form material averages for C&D categories in Egypt. Efforts should be taken to improve these estimates on an ongoing basis and contract terms should carefully address this problem.*

## Identify Current C&D Collection Practices

Under the existing C&D management system, much of the waste material is left in piles at the project site. If the materials are removed it is usually to an empty lot or a roadside. Because this practice is in violation of existing laws and regulations, the parties involved may not be forthcoming with accurate information regarding collection and disposal practices. The intent of the information gathering is not to cast blame on current C&D generators and disposers, but to generate sufficient information to evaluate and implement an improved C&D system.

**Broken toilet placed on curb.**

**Sidewalk and curb repair debris.**

The planner must seek information from as many sources as possible. These sources include:

- Solid waste system managers.
- Waste collection system operators (or contractors).
- C&D collection contractors.
- Transfer station and disposal site operators.
- Building permit and development system managers.
- Building contractors of all sizes.
- Regulators for solid waste systems.
- Property owners.
- Groups representing the construction industry, individual citizens, and property owners.

It should be recognized that the current collection system serves a wide range of users and is serviced by a wide range of providers. In addition to larger, well-equipped, contractors, C&D collection system users include:

- Property owners repairing, remodeling, or building their own properties.
- Small contractors that do not have access to vehicles to provide transportation to disposal sites or the medium to large equipment that would be used to store and transport C&D to disposal locations.

Even though the current system results in a significant amount of improper disposal, there are contractors available that provide C&D collection service. Unfortunately, many of these contractors are not licensed and do not transport the material to an approved disposal site because in most cases, authorized disposal sites are not available or are very difficult to access.

## Identify Current C&D Disposal Practices

To identify any current C&D disposal sites, the planner should first have discussions with and review the records of the local government officials who have the authority to designate those sites. If authorized sites are available then they should be documented. Another source of information on potential C&D disposal is from the managers of the MSW disposal system. Some C&D is probably allowed to be disposed of at the MSW sites, and policies regarding the acceptance of C&D at MSW sites should be researched.

While there may be established and authorized sites in some areas, it is clear that the most common C&D disposal sites are not authorized. Planners should attempt to locate commonly used sites whether they are authorized sites or not and begin to document the locations that may need to be cleaned up or that may be suitable for future permitted and managed C&D disposal.

For any current disposal site identified, the planner should obtain the following information:

- Owner/operator contact information.
- Status of all permits.
- Capacity of site.
- Policies toward the acceptance of C&D.
- List of materials accepted.
- List of largest site users.
- List of potential user types, large contractors, public agencies, individuals, etc.
- Cost of disposal.

**Materials separated for recycling.**

For any disposal site identified that is not permitted or authorized, the planner should attempt to determine if the owner allows disposal activities. All sites, permitted or unpermitted, should be documented for their potential to be part of any new system and for potential future clean up and enforcement actions. Any disposal activities on vacant lots and roadsides should also be documented for future consideration. However, an extensive search for these sites should be considered a future task to be included in the potential enforcement activities.

The current disposal system for residential, commercial, and industrial wastes should be reviewed and documented. This review should focus on the current policies regarding the acceptance of C&D. This review should consider the different types of C&D such as general construction debris, excavation waste materials, and demolition debris. One should also document whether a site merely disposes of these materials or if they use them for other activities such as daily cover, road building, or other useful purposes.

In the review of the current MSW disposal system any existing or planned transfer stations should be identified. Generally, MSW transfer stations limit the types of waste accepted. They may not be willing, or able, to accept materials such as excavation soils or large demolition project debris, but may be able to accept other materials such as construction debris. Transfer station policies toward acceptance of waste from individuals, businesses, and/or contractors should also be documented.

***While most MSW collection programs prohibit disposal of C&D in the MSW containers, small amounts are usually allowed. The policy regarding the collection and disposal of small quantities of C&D into the MSW waste system should be reviewed and documented. It is also possible that the collection and/or disposal of some, or all, C&D may be made part of the MSW contractor's responsibilities. Any previously issued contracts should be reviewed and their relationships with the C&D system should be documented.***

## Identify Current C&D Enforcement Methods

The planner should now identify the current enforcement programs that relate to the management of C&D. Agencies involved in any of the following activities may be involved, or perhaps should be involved with C&D regulation and/or enforcement:

- Construction permitting and planning.
- Building construction or inspection.
- Health monitoring.
- Environmental monitoring.
- Solid waste management.
- Law enforcement including police and procecutors.

Any potential enforcemment agencies should be identified and interviewed, and the information documented for consideration during the evaluation phase (Step 3). The interviews should document current activities, actual or perceived limitations on enforcement such as resources, legal or regulatory obstacles, and suggestions for program changes.

## Assess Accumulated C&D Waste

Accumulated waste is a significant problem in Egypt. Decision makers must choose whether or not it will be included as part of the privatization option, or left to be part of a future enforcement program. However unless the accumulated waste piles are removed or managed in a satisfactory method, the incentive for system improvement as well as the success of a new program will be undermined.

Conducting a detailed survey of accumulated C&D throughout the planning area is not realistic given the scope of the problem. However, some sort of reliable information must be obtained in order to plan for its management and future programs. One option is to conduct a survey of one or more representative areas and use that information to estimate quantities and conditions throughout a planning area. The size of the sample area and the level of effort required should be used to determine the reliability of the resulting estimates. Such a survey would include:

- Type of waste materials (composition).
- Quantity of waste materials.
- Location of waste materials.
- Whether materials are on public or private properties.

The level and accuracy of information collected during Step 1 will be important factors when options to improve the C&D system are considered. Decision makers will feel more confident if the information is adequate and system user will be more inclined to accept—and pay for—the system improvements if the needs are well-documented.

*Recycling activities for C&D waste can take several forms. Some landowners consider the use of excavation soils for site regrading to be recycling. For others, activities such as MSW landfills using these materials for daily cover and road construction are considered recycling activities. Any of these activities can be considered recycling options if they are legally permitted under current laws or if the laws specifically exempt them from regulation.*

**Uncontained C&D debris next to newly-constructed apartment building.**

# STEP 2:

# IDENTIFY AND ASSESS C&D MANAGEMENT OPTIONS

After developing an understanding of the current C&D management situation in the planning area through Step 1, the planner will need to identify and assess opportunities for service improvement. The primary issues to be determined include who will be responsible for C&D collection, recycling, and disposal, and who will pay for it. The goal is to have C&D properly collected and then recycled or disposed.

The options for collection and disposal of C&D are potentially different for the different materials that are included in the overall C&D definition. The composition and quantities of C&D material should be assessed in Step 2, but usually four general categories of waste materials will be found. These are:

- Excavation soils such as dirt, sand, rock, and other natural soils resulting from excavation for foundations and other grading activities on a construction site.
- General construction debris such as plaster, sheetrock, wood, plastics, wiring, metal, etc.
- Demolition materials such as concrete, masonry, and potentially wood.
- Roofing materials such as concrete, asphalt, corrugated metal, and potentially wood.

## Survey Stakeholders

The collection and disposal of C&D involves a wide range of stakeholders that may or may not be involved with the mainstream solid waste management system. It is very important to understand the attitudes and behavior of contractors, collectors, and other stakeholders that will be users of, or at least impacted by, any new C&D management program.

Involving all-important stakeholders in the process of developing the questions and issues to be covered in the assessment of the existing system will add to the quality of the information gathered and foster greater engagement. One important group to be considered is the landowners, private and public, upon whose land much of the existing C&D has and could be stored or disposed. The planner should, at a minimum, seek the following information from land owners, regulators, building contractors, MSW system managers, building permit system managers, waste collection system operators (or contractors), transfer station and disposal site operators, or other groups and individuals citizens:

- Opinions of existing services and service provider performance.
- Their ability and willingness to co-operate in the planning and implementation of improved service.
- Their ability and willingness to pay more for expanded or improved C&D system.
- Their ability and willingness to use and pay for the recycled C&D products.
- The expectations they have for the quantity and quality of C&D materials.
- Their attitudes and behavior in participating in experimental or pilot projects, particularly relating to the use of new collection services.
- Their attitudes and behavior in participating in experimental or pilot projects, particularly relating to the use of new disposal sites.

**Discarded remnants of construction left in street.**

## Identify Options for Improving C&D Collection

Collecting C&D is not a difficult task. The collection methods typically used for C&D are the same as those used in the MSW collection systems for indus-

**Sewer construction waste.**

trial waste. They also may be the same trucks and loaders that are used on typical construction projects. The difficult part of solving the C&D problem is getting generators and contractors to take the C&D to an approved disposal or transfer location rather than leaving the waste material on-site or dumping it at the nearest convenient dumping location, legal or not. The key to finding an effective management option for C&D is to determine how to provide a system and an incentive for proper C&D disposal.

In evaluating collection options for C&D materials, separate alternatives for different C&D materials may be considered. The following are examples of the variety of collection and disposal options for the different waste categories.

1. **Excavation Soils:** Collection and transport of excavation soils are typically managed as a subcategory of a construction project. These materials are mostly inert and may be moved to another location on site or they may need to be removed. If they are used on-site they do not become part of the C&D system but should be managed in accordance with the building permit. If they have to be removed from the site, then they should be taken to an approved disposal site or be re-used in the regrading of another site. If an off-site location is selected, it should be a permitted under a construction permit or as an authorized disposal site. The collection and transport of excavation materials is usually accomplished with a truck and other specialized earth moving equipment.

   Collection and transport of excavation materials and demolition waste may be more effective if left up to construction and demolition contractors. They have the specialized equipment necessary to move large volumes over short periods of time. In this case, an effective C&D alternative would be to assure that legal and convenient disposal sites exist and that an adequate enforcement program is in place to make sure the material is taken to the proper sites.

2. **General Construction and Demolition Debris:** Collection of general construction debris may include a wide variety of materials such as wood, plastic, concrete, masonry, and other materials. Even though these materials generally do not contain a substantial amount of putresible (organic) materials they should be disposed of at an authorized disposal site and not used for fill in a regrading activity. Collection can be done with general construction equipment, such as trucks. Containers that are used to store and collect MSW from larger locations such as industrial waste sites may also be used for C&D. Demolition waste can be a mixture of any material that is used in the construction of a building, or other structure. It can also be material that is left behind from previous activities at a site. Demolition materials are usually removed from a site during the demolition process. However, they are sometimes stored on a site for an indefinite period. They are typically collected and transported using trucks or MSW containers as described for construction debris. Small quantities are sometimes collected in the MSW system.

   C&D from medium to large projects is probably best managed with the same equipment used for industrial waste. One C&D option may be to consider managing this waste separately from other C&D materials. This could include making it a responsi-

*The key to finding an effective management option for C&D is to determine how to provide a system and an incentive for proper C&D disposal.*

**Construction and demolition debris begin processed at landfill.**

bility of an industrial waste contractor. Similarly, the residential and commercial collection contractor may, best manage the collection of C&D materials from small to medium generators.

3. **Roofing Materials:** Roofing materials typically contain asphalt or other sealant and insulation materials. Sometimes roofing materials include wood or metal sheeting. In Egypt, most roofs are constructed of concrete and sealed with asphalt. However, some smaller structures us corrugated metal sheets. This material can be collected and transported the same as demolition waste.

One alternative for managing the C&D stream is to continue to rely on the property owners and contractors to deliver waste materials to proper disposal sites. While this has not provided acceptable results in the past, several changes could be implemented to enhance and improve the C&D collection system.

Providing convenient, authorized disposal sites would significantly affect the effectiveness of the current system. Whether these sites are landfills, transfer stations, or recycling facilities, they must be available, convenient to use, well-known by potential users, and reasonably priced. Once proper disposal sites are available, an effective enforcement program needs to be implemented. This program would make sure that waste materials are removed from a project site and delivered to a proper disposal site.

Another management alternative is for a governorate to contract with a private contractor to provide C&D collection services to property owners and building contractors. Under the privatization model adopted by many governorates in Egypt, they could contract with one, or several contractors, to provide collection of all C&D. The governorate would design collection specifications for all, or part of, the C&D stream. The specification would make it the C&D privatization contractor's responsibility to work with construction contractors and property owners. It would be necessary to have C&D removed from a project site and transported to an authorized disposal site. If convenient—and free—collection and disposal of C&D were available to a contractor or homeowner, then illegal disposal of such materials may cease.

*Any privatization model must consider the different needs of the range of users who will be part of the C&D system.*

The privatization model could be implemented in several forms to enhance proper disposal. In one, C&D materials could be added to the duties of an MSW contractor. In another, the governorate could designate one or more areas in their jurisdiction and issue franchise or licenses to C&D collection contractors. A franchise, or license, to collect and transport C&D might be an exclusive arrangement that allows only one C&D collection contractor to provide services in an area. There could also be non-exclusive franchises that allow the C&D contractors to compete for business. Currently, there are private contractors who offer C&D collection and disposal services. Since they must charge a fee, some generators are reluctant to use them. In many cases these same contractors also use illegal disposal sites and are therefore part of the problem.

Any privatization model must consider the different needs of the range of users who will be part of the C&D system. Small-to-medium-sized users may best be served with different equipment that that used for large projects. Also, different materials may require the use of different equipment.

## Container Delivery and Pick-up

Chapter 8 discussed the containers that can be used to store waste materials prior to collection and to provide an efficient collection system. For small-to-medium-sized commercial and institutional generators, metal or plastic rigid containers were shown as one alternative. These containers range in size

from 1 cubic meter to 6 cubic meters. These containers are ideal for handling small to medium amounts of C&D waste materials. They also have the advantage that they can be collected on the same route as the commercial and institutional customers. One disadvantage is that C&D uses may be temporary and a container would have to be delivered for use for the duration of a project and then removed.

### Bulky Waste Collection within MSW Program

Another method of handling small-to-medium amounts of C&D material is within the bulky waste collection program. Many alternative systems for MSW collection allow users to dispose of extra waste or bulky materials. These are typically limited in quantity and may be collected with other materials or with separate collection crews. Some, or all, types of C&D could be included in the definitions of bulky waste.

### Industrial Roll-off Containers

Many industrial customers are served with large metal bins know as roll-off or drop box containers. These roll-off containers generally range in size from 8 to 40 cubic meters. They are delivered to a construction site and generally left to be filled by a construction contractor. They can also be loaded while the delivery truck waits. The advantage of the roll-off containers is that they allow contractors to store waste materials in them as the waste is generated and they do not have to reload the material for collection. The roll-off containers can be hauled directly to a disposal site and then reused at another location.

*Before reviewing the options for C&D disposal sites, the standards that will be applied to those sites must be determined.*

### Construction Dump Trucks

Dump trucks are used on construction sites for many purposes including delivery of materials and hauling C&D and other materials. They have many configurations in box type and in size. While dump trucks are sometimes used to store C&D waste at a construction site, in most cases the materials are stored on the ground and loaded into the truck later.

## Identify Options for Improving C&D Disposal

Before reviewing the options for C&D disposal sites, the standards that will be applied to those sites must be determined. Landfills for MSW are generally designed, constructed, and operated to minimize the pollution of surface water and groundwater and to control other environmental impacts such as odors, dust, and litter. The Egyptian Environmental Affairs Agency has developed guidelines for MSW landfill siting and design. These guidelines are discussed in Chapter 16 (Landfills).

**Debris from small remodeling jobs can add up to a big amount.**

**Construction and demolition trailer being unloaded.**

*Effective enforcement must be a significant part of any alternative to improve the collection of C&D. It will always be cheaper to leave waste at the location where it is generated or dump it nearby if no one enforces the regulations that prohibit such actions. Enforcement programs to assure proper collection and disposal of C&D could be implemented by several agencies within a local government. Several of these possible agencies are listed in Table 9.4.*

Most C&D materials such as soil, rock, concrete, and masonry are inert and do not pose a threat to groundwater. The potential composition of construction debris would include plastics, metal, plaster, sheetrock and other materials. A decision should be made whether it is appropriate to allow this type of waste in an otherwise inert fill or if it should be directed to an MSW landfill. This decision should be based on the site characteristics including its potential to contaminate groundwater or cause a litter problem.

While there are no specific regulations for C&D disposal sites, the process to permit such a facility is similar to that of MSW landfills. To develop a C&D disposal site, an Environmental Impact Assessment (EIA) must be prepared. The EIA must fully describe the proposed disposal site and include both construction and operational techniques that will be used to minimize any adverse environmental impact.

Since most of the materials that will be placed in a C&D disposal site are inert and generally not subject to significant decomposition and settlement, the standards are substantially different than those for MSW landfills. The following standards are typical for a C&D disposal site:

- No liners are required.
- Daily cover of waste materials may not be required.
- A control system for methane may not be required.
- A control system for leachate may not be required.
- Adequate roads are required.
- Control of dust and litter is required.
- Leveling and compaction of waste material is required.

## Transfer Stations

Transfer stations can be a convenient alternative for accepting C&D materials for disposal. A transfer station is a facility where smaller vehicles can unload waste materials that are then reloaded into larger trucks for delivery to remote landfills or other disposal sites. Transfer stations can be designed to handle MSW only or they can include C&D. If the use of disposal sites for C&D materials is limited by distance or other operating conditions, then transfer stations should be considered for C&D. A transfer station provides services in a convenient location, thereby reducing the temptation to use illegal means of disposal.

Transfer stations are discussed in more detail in Chapter 13, Waste Transfer.

## Recycling

Recycling of C&D waste material can occur at a construction or demolition site, at a disposal site such as a landfill or transfer station, or at a separate facility specifically designed to recycle the waste materials. Using the quantity and composition information developed in Step 1, the planners can evaluate the need for, and potential of, recycling C&D. Generally, recycling of C&D materials includes the recovery of wood, concrete, masonry, metals, soils, and sheetrock or plaster. In Egypt, some of these materials, especially wood and metals, are already recycled or reused and are not present in C&D in significant quantities. Other materials such as soil, concrete, and masonry are the primary elements of C&D in Egypt.

Soil materials can be used for regrading sites, filling low-lying areas, or for daily cover at landfills. These uses may be limited in the volume of C&D that can be used beneficially. However, filling some disposal sites, such as quarries and pits, may provide beneficial uses for soils on a large scale. Similarly, concrete and masonry debris can be used as aggregate for making other

building products or can be used for road construction. These road construction materials can be used at MSW landfills or many other building sites. A simple process can be set up at C&D, or MSW, disposal sites to separate soil, concrete, and masonry materials into useful forms, such as daily cover and road aggregates.

## Identify Options for Accumulated Waste Materials

One of the large impediments to implementing an effective C&D collection and disposal system in Egypt is the vast accumulation of C&D materials that already exist on private and public lands. This material has accumulated over many years as a result of improper disposal practices. It exists on empty lots, on roadsides, and on many sites where it is simply not removed after a demolition or construction project is finished. One assessment that should be made is whether this accumulated waste material will be included in any future management system and, if so, how it will be handled. A significant question related to this issue is who will pay for the collection and disposal of this accumulated material.

*Potential C&D disposal site options include the following:*

- *Dedicated C&D disposal sites.*
- *Quarries.*
- *Other pits or low areas that need to be filled.*
- *MSW landfills.*

The collection and disposal of accumulated C&D material may be managed as part of a new system. It can also be handled separately. This material has accumulated over many years and is usually widely scattered over an entire jurisdiction. A program to clean up this material should recognize the scope of this problem and make sure that adequate resources and time are provided to solve it.

Many governorates have, or will, implement privatization contract for residential and commercial MSW collection and other services. If so, is likely that some, or all, of the equipment from past cleaning efforts will be available for other projects. These resources may be used to clean up the accumulated waste in a governorate. The primary resources that would be needed are dump trucks, front-end loaders, bulldozers, and laborers. If these resources are to be used, then a survey of the governorate to identify the areas that need to be cleaned up in the governorate should be done. A schedule can then be prepared to systematically clean up the high priority areas first and then the lower priority areas. This system could be used for public lands only or extended to private lands.

A governorate may also choose to hire a private contractor to clean up accumulated waste. If a private contractor is desired, the options include hiring a separate contractor for accumulated waste only, adding the accumulated waste clean-up duties to an MSW contractor, or including the duties in a C&D collection and disposal contract. In any option for contracting, a survey needs to be completed to determine the quantities and locations. This survey may be completed by a governorate, or may be included in the contractor's work scope. An adequate time should be provided to clean up accumulated waste. It may take anywhere from 1 to 3 years to properly collect and dispose of accumulated waste.

**Material transfer.**

Another means to deal with accumulated waste is to develop an effective enforcement program. This program could include enforcement of clean-up regulations on private lands and on public lands. This type of enforcement program would probably require the implementation of new laws and regulations and would also require a dedicated enforcement program. In addition, this approach would probably also require public or contractor resources to clean up areas where the landowners refused to do it themselves. Recovery of cost for these services would have to be included in the enforcement program. On public lands, the responsible governorate would be required to clean up their properties.

## Identify Options for Improving C&D Enforcement

Any program to improve the C&D management system will depend on effective enforcement of the rules and regulations. Even if a governorate chooses to provide all collection and disposal services to construction contractors and individuals, an enforcement program will be required to ensure compliance. The more a governorate relies on the generators to provide their own collection services, the more enforcement will be necessary. In addition to enforcement programs, planners should look for incentives to improve performances of generators.

Enforcement programs to assure proper collection and disposal of C&D could be implemented by several agencies within a local government. Several of these possible agencies are listed in Table 9.4.

### Table 9.4: PROS AND CONS OF POTENTIAL ENFORCEMENT AGENCIES

| Enforcement Agency | Pros | Cons |
|---|---|---|
| **Building Permit Authorities** | Permit writers would have knowledge of construction activities and of the contractors. Building inspectors would be onsite; many may have specialties. | Not all builders get permits. C&D is one of many items and may not be considered a priority. C&D is not a specialty and can get overlooked. Once the C&D leaves the site, an inspector loses control over the material. |
| **Solid Waste Management Authorities (MSW)** | Many local governments provide MSW collection and street sweeping services with their own employees. These employees, and to a lesser extent their supervisors, travel all areas of a jurisdiction. They could monitor and report on construction and illegal disposal activities. Contract Monitoring Units (CMU) are being developed for privatized MSW programs. These units include field monitors that inspect each area of a city or governorate on a periodic basis. They should be aware of construction activities in their zones, as well as illegal disposal. | A local service provider's job is to perform a service. They are not typically enforcement agents and have little authority to solve these types of problems. Contract Monitoring Units are designed to assure performance of a contract. Currently, these contracts may not include C&D activities. |
| **Environmental Management Agencies** | Some environmental management agencies such as EEAA could be used to enforce the C&D regulations that generally prohibit dumping in unauthorized locations. | Their role is generally to implement regulations and to assist local governments to enforce the laws within their jurisdictions. These agencies do not generally have enforcement personnel for this level of enforcement. |
| **Special C&D Monitoring Units** | A new agency could be developed to monitor and enforce C&D regulations. They could be provided with the resources and authority to monitor and enforce the laws. | A new C&D agency could create significant overlap with other jurisdiction and add additional costs to the system. |
| **Police Departments** | There are many different departments and specialties within law enforcement. They are usually assigned to specific areas such as traffic, crime etc. These agencies have the authority to enforce laws. | There are no departments or specialties within police departments that deal with solid waste specifically. Many are tasked with anti-littering laws, but in most cases this is a very low priority. |

While any of the agencies identified in Table 9.4 could be used to enforce a C&D program, the historical success of enforcement programs of national, regional, and local policies regarding enforcement must be taken into account. For C&D programs, enforcement is generally assigned to building inspectors, land use code inspectors, nuisance inspectors, or solid waste program managers. Very few governments use their police departments to enforce a civil program such as C&D disposal violations.

Regardless of which agency has primary responsibility for enforcement of a C&D program, it must have adequate resources. Additionally, C&D enforcement should be a priority and not just another assigned duty. Personnel assigned to provide this enforcement need to have the proper tools and resources to be effective. Laws may need to be implemented or modified.

One alternative many governorates are adopting in Egypt for solid waste programs is the development of a Contract Monitoring Unit (CMU) for their solid waste management programs. This CMU is responsible for implementation and enforcement of privatization contracts for collection and disposal of MSW waste. In addition, their duties include the enforcement of rules and regulations that apply to waste generators and customers. The programs are structured to provide field monitoring of all areas of a governorate and the management and support system necessary for the monitoring system to be effective.

*The use of a CMU for the enforcement of a C&D program has many advantages, and could provide the means for an efficient and effective enforcement system. Their focus and priorities are solid waste management. The field inspectors are already assigned to monitor neighborhood routes, where illegal storage on construction sites and illegal disposal on vacant lots is most prevalent. They are trained to manage contractor performance. Many of the C&D collection and disposal system elements are similar to and overlap with the MSW programs.*

**Uncontained and uncollected debris at building construction site.**

# STEP 3:

# COMPILE FINDINGS IN AN ASSESSMENT REPORT

In Step 3, the findings from the completion of the previous steps in this chapter should be compiled and summarized in an assessment report. This material is then used to solicit input from all stakeholders and governmental officials. The process of developing this document will illuminate any fundamental systemic problems. It will help to identify any problems with the C&D system options. The report should include the following components:

- An explanation of the legal framework.
- A summary of the findings from Steps 1 and 2.
- An explanation of the identified obstacles and constraints to desired service performance levels.
- An explanation of the identified opportunities for a recycling program.
- Preliminary recommendations of potential options for improving or implementing system elements for all, or a portion of, the C&D waste stream.

The assessment may reveal either a need or desire for improvement. Options that appear worthy of further analysis should be presented to the mass media for public review and feedback from customer groups and government officials.

**Railroad construction debris.**

# STEP 4:

# EVALUATE C&D PROGRAM SCENARIOS

Step 4 is a comprehensive evaluation of the potentially viable C&D programs. Individual scenarios should be formulated by combining different components identified in the previous steps, and then each option can be systematically evaluated to aid in the final decision-making process.

## Develop Preliminary Cost Estimates

Once the potential program elements for the C&D system have been chosen, the next step is to apply full cost accounting techniques to each potentially applicable C&D scenario using the financial management approach described in Chapter 3. This step must consist of developing preliminary system cost estimates for both government and private sector elements of improved C&D collection, disposal and enforcement services.

## Summarize Results

The estimated cost and the assessment of the compatibility of each scenario with the design criteria should be summarized in spreadsheet form. This will facilitate comparison of all viable improvement options analyzed by the planning team. The spreadsheet may be incorporated into a brief narrative report. This may be used to solicit feedback from stakeholders. It may also serve as the basis for final decision-making by the appropriate governorate officials. Several copies should be produced and widely disseminated among all interested parties.

*Use of the financial management approach requires the planner to seek out and develop a great deal of data for input. To use the approach for the purpose of calculating a preliminary cost estimate for each scenario (combination of strategic elements) refer to Chapter 3.*

**New construction materials at job site.**

# STEP 5:

# SELECT THE PREFERRED C&D PROGRAM

Once the cost of each of the C&D options has been calculated and input received, the final decision-making process can begin. This typically consists of the following tasks:

- Select collection, disposal, enforcement, and accumulated waste options.
- Calculate rates/tariffs and evaluate cost recovery methods.
- Solicit final round of stakeholder input.
- Governorate officials select the preferred C&D program that is most compatible with design goals.

## Select Collection, Disposal, Enforcement, and Accumulated Waste Options

Collection, disposal, enforcement, and accumulated waste options should be chosen carefully to assure that the programs are complimentary and consistent as a whole, and also be measured for compatibility with other solid waste management programs. In addition, the C&D program must be implemented in a way so that the construction industry can adapt to and help implement the selected programs. Regardless of the procurement and implementation options chosen, an effective enforcement element is crucial.

## Calculate Rates/Tariffs and Evaluate Cost Recovery Methods

Before selecting the preferred C&D options, the governorate needs to know if and how it will be able to pay for those options. The planning team should use full cost accounting methods described in Chapter 3 to evaluate cost-related issues that apply to each of the scenarios under consideration. These include the following:

- Comparison of other management alternatives.
- Developing tariff models.
- Examining "cost recovery" options such as recyclable material sales.
- Selecting the method of fee collection.

The results will include proposed expense and revenue schedules and identification of the pros and cons associated with each of the practical means for providing adequate revenues.

## Solicit Final Stakeholder Input

Once the planning team has calculated how much the preferred C&D options will cost, each user group category should be better able to make informed decisions about the program they prefer. It is essential that a period of time be allowed for widespread dissemination to, and feedback from, potential generators of C&D and the public at large. Governorate officials might find it useful to host public meetings to discuss the preferred C&D program options and the accompanying cost recovery systems.

## Governorate Officials Select Preferred C&D Program

Internal deliberation on the input received from the planning team and the general public should now take place among all of the appropriate governorate officials. An informed decision may now be made about which program has the highest probability of achieving C&D program design goals while still being affordable to the users. Ideally, it would also offer an affordable collection and disposable alternatives for the majority of the C&D users in the governorate. In the unlikely event that officials select to change one or more of the components of a system scenario, the scenario may have to be revised before receiving final approval.

**Recycled brick and concrete.**

# STEP 6:

# IMPLEMENT THE SELECTED PROGRAM

The planning team is now ready to begin the task of implementing the selected C&D program. Recommendations and a plan for implementation for any laws, decrees, and regulations that need to be added or modified should be the first order of business. If the governorate has decided to contract with the private sector for provision of C&D program services then the following tasks must accomplished:

- Establish the program funding mechanism.
- Procure a contractor(s).
- Develop and implement a means of contract administration and monitoring.
- Develop and implement a public awareness and communication program.

## Establish the Program Funding Mechanism

The governorate must be able to pay for the improved C&D management system, regardless of who will provide the services: a private contractor or the governorate. The governorate must decide who will fund the services and how the money will be collected.

If the C&D program is part of an overall integrated solid waste management system, then the costs should be rolled into the overall tariff structure and no separate fee is needed. If the property owner or contractor is to pay, then fees must be developed that covers the governorate's cost for things such as providing disposal sites and enforcement.

*If the services are to be provided directly by the governorate then an implementation plan should be developed. The plan should address the same issues and program elements that must be addressed when procuring private sector services.*

## Procure a Contractor

The competitive procurement or bidding process requires the preparation of two major documents by the contracting agency:

- A Request for Qualifications (RFQ).
- A Request for Tender (RFT).

Both of these documents are prepared by, or under the guidance of a technical or tender committee.

The RFQ is used to pre-qualify contractors who then will be allowed to submit bids or tenders in response to the RFT. Generally it provides the contracting industry with an overview of the project and outlines the disciplines and level of expertise needed to perform the project. The RFQ provides guidance on how the contractors should respond and how their responses

**Separated wood waste.**

will be evaluated. If the preferred alternative is to include C&D services in a larger solid waste system contract then care should be taken to review and analyze specific C&D qualifications and proposals.

The RFT is the document the pre-qualified bidders use to prepare their tenders. It generally consists of a book of conditions and annexes, including technical specifications. It provides great detail about the required services and typically becomes a part of the contract between the governorate and the selected contractor.

Comprehensive instructions on how to prepare and use both of these documents are presented in Chapters 4 and 5, as well as on how to select and execute a contract with the successful bidder. Specific instructions on how to prepare technical specifications for the appendices of an RFT for C&D debris management are presented in Appendix A to this chapter.

## Develop and Implement a Means of Contract Administration and Monitoring

An organizational structure is needed to administer and monitor the contract and contractor operations. When a governorate signs a contract with a private sector contractor to provide any solid waste management service, including C&D, that contract must be monitored by the governorate. Monitoring ensures that the contract terms and conditions are being met, and that residents and businesses are being provided the services specified in the contract.

**Recycled wood chips.**

Contract monitoring and administration of a solid waste and/or C&D services contract requires developing an institutional infrastructure dedicated solely to that purpose. Chapter 6 (Contract Monitoring) provides comprehensive guidance for planning the contract monitoring component of a solid waste management system.

A Contract Monitoring Unit (CMU) is generally assigned the duties to implement and monitor contracts with private firms. One alternative use for the CMU with C&D is an effective enforcement program. A CMU's duties usually include enforcement of laws, decrees, and regulations. Even if privatization is chosen as the preferred option, a strong enforcement element needs to be provided to deal with C&D. If enforcement chosen as the only component of an improved C&D waste strategy, then an even larger enforcement element will be required.

## Develop Public Awareness and Communications Campaign

A public awareness and communications campaign is critical to the successful implementation of any policy decision, particularly when it requires the support of the public and behavioral changes from constituencies. C&D waste policy and program success may be dependent upon resident, business, and contractor participation. Optimization of participation requires a comprehensive and professionally developed long-term plan to build public understanding of, support for, and use of, the C&D program. Public acceptance of the C&D program is especially important when facility sites are chosen and owners of private and public lands are forced to clean up illegal piles.

Chapter 7 is devoted to how to manage a general public awareness campaign to ensure that the public understands the new C&D waste program. It describes the steps that should be conducted to implement a successful public awareness campaign. In addition, it provides guidelines on building a Public Awareness and Communications Team (PACT) within the contract monitoring organization that can take the responsibility of managing such a campaign. It explains in simple terms who will do what, when, and how.

# APPENDIX A: INSTRUCTIONS AND EXAMPLES FOR TECHNICAL SPECIFICATIONS

Technical specifications are part of the appendices to the contract general conditions of the Request for Tender (RFT). The technical specifications should include the following information, typically organized as follows:

- Definitions.
- General Description of Services.
- Service Specifications.
- Minimum Technical Requirements.
- Performance Standards.
- Performance Monitoring.
- Measurement and Payment.
- Penalties.

Detailed instructions on how to prepare all of these sections is provided in Chapter 5. Information specific to a construction and demolition debris (C&D) program that needs to be addressed in the technical specifications is presented in this appendix. Although information on C&D collection and disposal are presented here together, it also is possible to write specifications for either service alone and bid them independently of each other.

## General Description of Services

This section of the technical specifications should provide a broad overview of the desired services and present the bidder with the necessary background information on the service area.

The following provides examples of text and information to be addressed in a general description of services.

### Overview of Desired Services

The overview should state clearly and succinctly the overall services desired.

### Information on C&D in the Governorate

The general descriptions of services also should include relevant factual information obtained or created in the C&D program design process. The information should be summarized in clear tabular form. Information presented should include:

- C&D waste types.
- C&D waste quantities.
- Current C&D collection methods.

### Example Overview of Desired Services

*"The contractor shall furnish all labor, supervision, materials and supplies, permits, licenses, insurance, and equipment necessary for the collection of all C&D generated from C&D generators located in the governorate. All collected C&D waste shall be transported to a designated disposal facility approved by the governorate. The contractor may divert C&D waste to beneficial use subject to review and approval on a case-by-case basis by the governorate project administrator. The contractor shall perform these services in conformance with the specifications and requirements contained in this article and in accordance with all other requirements of the request for tender."*

*"The governorate intends to award a contract to one contractor for the design, construction, and operation of one or more C&D landfills to serve the entire governorate. The contractor shall be responsible for providing disposal capacity that complies with the requirements of this article and in accordance with all other applicable requirements of the request for tender and the contract."*

*"The governorate intends to procure one or more contractors to collect C&D and to recycle and/or dispose the wastes as appropriate. The governorate will allow private haulers to deliver acceptable waste to the C&D landfill. Therefore, the traffic flow to the C&D landfill will include transfer trailers, waste collection vehicles, dump trucks, private cars and pick-up trucks."*

*"The governorate estimates that ____ tons per day of C&D are generated in the governorate. Waste tonnage to the C&D landfill may vary on a daily, weekly, monthly, and annual basis. The peak C&D waste disposal could be up to_____ tons per day or _____ tons per year. The C&D landfill shall be designed and operated to accept both average, as well as peak daily tonnages. Available data on the physical composition of the C&D is limited. It is the contractor's responsibility to make an assessment of the quantities and the contractor should rely only upon his or her own estimates."*

- Current C&D disposal methods.
- Available existing C&D collection, transfer, and disposal equipment.
- Available existing C&D transfer and disposal sites.
- Information relating to the general solid waste collection and disposal programs.

If the governorate intends to provide one or more disposal sites then those facilities should be described and all available information should be summarized in this section and included for the contractor's use within the specifications or appendices. If the governorate does not have an authorized C&D landfill within its jurisdiction, or intends to furnish or designate one or more sites, that should also be made clear in this section.

**Example Site Description**

*"The governorate intends to provide a __ -feddan site to be used by the contractor for the C&D landfill (site). The site is near the town of _____. The C&D landfill will be used for disposing only of wastes generated in the governorate. Such wastes shall include construction debris, demolition debris, excavated soils, and any other waste type designated by the governorate."*

Any potential C&D landfill site that is to be made available to a contractor should be described in as much detail as possible. This description should include the location, size, general condition, surrounding area land use and ownership, site permit status, available transportation features, and geological information. Environmental assessments or any other available reports on a disposal site should be identified and provided to the contractors.

Site characteristics information should, at a minimum, include:

- Site topography.
- Site geology.
- Site hydrogeology.
- Prevailing winds.

### Preparation Period

The technical specifications should also provide the contractor with a preparation period of a specified duration following the contract signing date. This will provide the contractor with sufficient time to, among other things, accomplish the following:

- Finalize disposal site design, permits, and equipment procurement.
- Finalize field data collection (C&D waste types and quantities, bin sizes, etc.).
- Order, receive, and mobilize equipment and vehicles.
- Recruit and train management and operations personnel.
- Prepare necessary routing maps and schedules.
- Establish/build facilities for housing and maintaining collection equipment.
- Secure required service agreements with vendors.
- Develop and implement an information program specifically for C&D waste generators.

**Example Summary of Intent**

*"The intent of the governorate as prescribed in this request for tender is to provide C&D waste generators with C&D waste collection and disposal service at the best price and with the highest quality of service. To this end, the governorate has provided some information to all pre-qualified bidders in order to assist them to compute fair and reasonable financial offers. However, it is the sole responsibility of pre-qualified bidders to exercise due diligence in assessing all existing work conditions and to ultimately rely on his or her own assessments in the calculation of prices submitted in the tender offer."*

### Summary of Intent

The general description of services should end with a summary of intent.

## Service Specifications

Service specifications describe the work to be done. The primary objective of service specifications is to provide bidders with a

clear understanding of what services you want the contractor to provide. It tells the potential contractor what, where, and when. Service specifications for C&D collection programs should specify the types of service to be provided and address the following strategic elements of the desired service:

- Types of C&D materials to be managed.
- Source of the waste materials.
- Quantities to be collected.
- Points of collection.
- Collection frequency.
- Recycling or other diversion requirements.
- C&D disposal requirements.
- Site location requirements.
- Environmental and health and safety concerns.

Service specifications also tell the bidders what work plans are required from them as part of their technical proposal, as well as the work plan requirements for the successful bidder. Typically a draft work plan, a preparation work plan, and a final work plan are required.

### Draft Work Plan

As part of the tender offer, each bidder should be required to submit a draft work plan (DWP) that illustrates his or her understanding of the service requirements and describes exactly how the company intends to perform them. In addition to the standard items, C&D collection issues the contractor should address in the DWP include:

- Maps of proposed C&D collection routes, including a description of factors used in their development.
- Performance guidelines for waste collection vehicle operators.
- Manufacturer's literature for each type of waste collection vehicle, other equipment, and C&D waste bins.
- Project schedule showing completion dates for acquiring permits, completion of design engineering, construction of all facilities, and start-up of commercial operations.
- Plans and procedures to acquire all construction and environmental permits.
- Site plan showing access roads, property boundaries, existing and final elevation contours, access roads, perimeter fencing areas and entrance gates, major structure locations including the scalehouse, drainage facilities, and maintenance yard.

#### Example Service Specification for General Scope of Services:

*"The contractor shall procure, distribute, service (empty contents), and maintain C&D waste bins with volume sufficient to contain the total volume of solid waste generated by each C&D waste generator in the time period between servicing (emptying)."*

#### Example Service Specification for C&D Waste Collection Equipment

*"The contractor shall have on hand at all times, and in good working order, such C&D waste collection equipment as shall permit the contractor to adequately and efficiently perform C&D waste collection service as specified in this article."*

#### Example Service Specification for Designated Facilities

*"All C&D wastes collected as a result of performing C&D waste collection services shall be transported to designated transfer or disposal facilities, where the weight shall be measured and recorded using certified automated scales."*

#### Example Service Specification for C&D Waste Diversion

*"The contractor shall divert and recycle a minimum of __ percent of the C&D waste collected in order to reduce the amount disposed at the designated disposal facility. Diversion shall be accomplished by delivering recyclable materials to a designated processing facility or directly to an approved third party for beneficial use."*

- Preliminary landfill design, construction and operations plan.
- Equipment list.
- Staffing plan.

### Preparation Work Plan

The contractor should be required to submit a preparation work plan (PWP) within a specified time period after the signing of the final contract, describing in detail the contractor activities during the preparation period. The preparation work plan should provide schedules for the initiation and completion of all preparation period activities including, but not necessarily limited to, the following:

**Example Service Specification for C&D Disposal**

*"The contractor shall be responsible for the design, permitting, construction, operation, and ultimate closure of the C&D landfill, and all associated appurtenances and facilities, including, but not limited to, access roads, site fencing, scalehouse, office building(s), utilities, utility hook-ups and environmental control systems. The contractor shall be responsible for conducting appropriate quality assurance and quality control procedures during all construction activities, and shall provide record or "as-built" drawings of all facilities constructed. The contractor also shall be responsible for the procurement and maintenance of all equipment and supplies necessary for construction."*

- Overall project schedule.
- Collection routing.
- Final engineering design.
- Recruitment and training of labor and supervisory personnel.
- Procurement of supplies and equipment.
- Facility construction.
- Finalizing site field data collection and analysis.
- Environmental Impact Assessment (EIA) preparation and Egyptian Environmental Affairs Agency (EEAA) approval of the final EIA.

### Final Work Plan

The final work plan is submitted by the contractor after the contract is awarded. It should incorporate all the elements of the DWP and the PWP together, and address refinements and modifications discussed and agreed upon between the Governorate and the contractor prior to execution of the contract.

## Minimum Technical Requirements

The purpose of the minimum technical requirements is to set conditions relating to "how" the contractor shall perform the specified services. In other words, minimum technical requirements establish guidelines that will ensure that the contractor provides the services in a manner that is compatible with each of the program design criteria. Minimum technical requirements should clearly, but simply, state what you expect.

Instructions for preparing all the components of minimum technical requirements can be found in Chapter 5. The sections below contain information related specifically to C&D management.

### C&D Collection Vehicles

To ensure that the C&D collection contractor(s) utilize collection vehicles that meet the governorate's technical, economic, service quality, health, safety, environmental, and aesthetic criteria, the technical specifications should include minimum technical requirements that address the following C&D collection vehicle concerns.

1. **Ancillary Equipment:** Minimum technical requirements should include an article addressing the need to equip every collection vehicle with safety and emergency response accessories. It should require at a minimum that each C&D collection vehicle be equipped with:

   - A fire extinguisher.
   - A first aid kit.
   - A shovel and broom for the removal of any spillage of waste.
   - An audible backup warning device that activates each time the vehicle backs up.
   - Two-way communication with the field supervisor and contractor's dispatch/maintenance office.
   - Flares, flags, and wheel chock blocks for use when breakdowns occur on public streets.

2. **Collection Vehicle Appearance:** It is important for the contractor to maintain the appearance of the collection vehicles. Clean, freshly painted vehicles send a message to the public that C&D collection is a public service that is beneficial to a clean environment and a higher quality of life. The contractor should be required to paint all collection vehicles at least once every 5 years.

3. **Collection Vehicle Garage and Parking:** A minimum technical requirement is needed to ensure that collection vehicle maintenance and parking facilities do meet environmental standards and do not create potential health or safety hazards. The contractor should be required to provide written notification to the contract administrator as to the parking location of all collection vehicles 30 days prior to the first day of service and annually thereafter. No contractor vehicles should be stored on any public street or other public property. Also, if collection vehicles are kept within contract service area boundaries overnight, they should be parked and be maintained on private property within a building or fenced yard when not in use.

4. **Collection Vehicle Inventory:** The contracting agency will want to have a record of all of the vehicles that the contractor intends to employ in the collection of C&D. This will provide assurance that the number and type of vehicles is adequate, and for the agency to have on record in case of complaints from citizens and businesses concerning vehicle operation. No later than 30 days prior to service commencement, and annually thereafter, the contractor should provide a list of the equipment to be used specifying the year, make, model, identification number, and gross vehicle weight (GVW) of each C&D collection vehicle.

5. **Collection Vehicle Inventory Changes:** Changes in the equipment inventory during the operations period shall be reported in writing to the governorate project administrator within 24 hours of the effective date of the change.

6. **Collection Vehicle Licensing and Inspection:** The contractor should be required to use collection vehicles registered, inspected, insured, and in compliance with all local ordinances and national laws pertaining to motor vehicle ownership and operation. This will reduce the risk of the contractor having improperly equipped vehicles on the road that could be a threat to public safety and general welfare. It will also ensure that the contractor has insurance to cover any property damage or injury to any motor vehicle operator or pedestrian.

7. **Collection Vehicle Loading:** Overloaded collection vehicles increase maintenance costs, pose a threat to public safety and contribute unnecessarily to the deterioration of streets and roads. To prevent the contractor from overloading vehicles, the minimum technical requirement should not allow loading in excess of the manufacturer's GVW rating or in excess of the maximum weight specified by the Egyptian Roads and Bridges Authority.

8. **Collection Vehicle Maintenance:** C&D collection vehicles have many moving parts and are subjected to almost as much punishment as a waste collection vehicle. Egyptian experience has demonstrated that inadequate maintenance of waste collection vehicles has been a root cause of failure of government-provided waste collection service. Even new vehicles require continuous preventative maintenance in order to function in a safe and operable condition over the expected useful life of the vehicle. While it certainly is in the interest of the contractor to maintain the equipment, it is also in the interest of the contracting party and the ratepayers that it represents to do everything in its power to minimize any risk of service interruption caused by failure of the contractor to give vehicle maintenance the critical attention that it deserves. To that end, the contractor should be required to submit accurate records of repair in a monthly operations budget, documenting maintenance of all C&D collection vehicles in a safe and operable condition, to minimize the threat to worker and public health and safety, and to reduce vehicle impact on the surrounding environment.

9. **Collection Vehicle Markings and Identification:** Collection vehicles used by the contractor should have appropriate signage and markings to facilitate identification by customers, traffic police, and employees at transfer and processing facilities. It is recommended that

all vehicles used in either the supervision or provision of C&D collection service have highly visible lettering at least 10 centimeters (cm) in height on each side of the vehicle body indicating the name and customer service telephone number of the contractor, identification of the contracting agency, and vehicle identification numbers (numbered consecutively). The contractor's business name should not contain the name of the contracting agency or imply ownership by the contracting agency. In addition, all C&D carrying vehicles should have the carrying capacity, in cubic meters ($m^3$) and GVW, of the vehicle identified in numbers at least 12 cm in height displayed in the upper front corner of the left and right sides of the body

10. **Collection Vehicle Operation:** The contracting agency is the guardian of the safety of the general public. It has the responsibility and authority to minimize the risk that C&D collection vehicle drivers might pose to public safety. To that end, establishment of minimum requirements regarding the licensing and driving skills of the contractor's collection vehicle operators are warranted. The requirement should ensure that the contractor use only personnel specifically trained in the safe and efficient operation of collection vehicles. In addition, all vehicle operators should be required to have all required permits and licenses. The contractor should be required to provide documentation of compliance with this requirement no later than 10 days prior to commencement of collection operations along with evidence that all collection vehicle operators have been provided vehicle operation and safety training and have passed a written examination and driving test.

11. **Collection Vehicle Sanitation:** In addition to maintaining the appearance and mechanical functions, the contractor should be required to regularly wash and sanitize collection vehicles to minimize odors and insect propagation, and to protect workers and public health. To that end, the contractor should be required to wash the interior of the cargo area of all vehicles used for the purpose of collecting and transporting any C&D materials with water and a disinfectant and deodorizing cleaning agent. This should be performed at a minimum of weekly, and/or according to the schedule submitted as part of the final work plan. In addition, the contractor should be required to wash all exterior surfaces of collection vehicle chassis and body with water and a detergent a minimum of one time per every 2 weeks.

12. **Daily Collection Vehicle Inspection:** As an additional means of reducing the risk of contractor use of collection vehicles that are unsafe or not fully functional, the contractor should be required to inspect vehicles daily before they leave the yard. In addition, the contractor should be required to take out of service any vehicle that does not pass inspection. Daily inspection reports should be made available to the contract administration agency upon request.

13. **Daily Collection Vehicle Inspection Reports:** The contractor should be required to maintain accurate daily collection vehicle inspection reports that should be made available to governorate project monitors immediately upon request for review and approval of collection vehicle usage.

14. **Reserve Equipment:** To minimize the risk of interruption or delays in service delivery the contractor needs to have an adequate level of collection equipment in reserve at all times. To achieve this goal the contracting agency should require that the contractor have available at all times, reserve equipment which can be put in service within 2 hours of any breakdown so that no interruption in regularly scheduled collection service occurs. Such reserve equipment should be required to correspond in size and capacity to the equipment normally used by the contractor to perform the C&D collection service.

15. **Use of Collection Vehicles without Hydraulic Compaction:** C&D is most likely to be collected using vehicles without hydraulic compaction. This is acceptable provided that:
    - All wastes must be enclosed and covered when the distance between collection points exceeds 100 meters (m).
    - The speed of the vehicle exceeds 30 kilometers (km)/hr.
    - Such vehicles are equipped with a mechanical dumping mechanism.

16. **Waste Containment:** The contractor should be required to only utilize vehicles with bodies that were manufactured for the purpose of consolidating and storing waste. Thus, the area of the collection vehicle body used for the storage of C&D should be watertight and prohibit spillage of any solids or liquid waste materials, oil, grease, or other substances onto the ground or exterior body of the vehicle. In the event that any C&D materials are dropped or spilled during the contractor's operations, he or she should be required to clean it up immediately.

## C&D Bins

Typically C&D collection contractors will provide bins or other containers at the construction/demolition site in which to place C&D materials. Therefore it is logical to include provision of storage containers as part of the service specifications. To ensure that the contractor procures and supplies containers that meet the governorate's technical, economic, service quality, health, safety, environmental, and aesthetic criteria, the technical specifications should include minimum technical requirements that address the following C&D container concerns.

1. **Bin Technical Specifications:** The bidder should submit with his technical offer, manufacturer's literature that verifies that the bins he or she will provide meet or exceed the following minimum technical specifications:

    - Material of construction: bins should be manufactured from steel or aluminum.
    - Volumetric capacity: a minimum capacity of 1 $m^3$ and a maximum capacity of 30 $m^3$.
    - Compatibility: bins should be compatible with commercially available mechanical rear loading, front loading or tilt-frame (for roll-off bins) waste collection vehicles.
    - Standards of design: designed to meet all relevant sections of American National Standards Institute (ANSI) Z245.30 –1999 and Z245.60 –1999, or equivalent.
    - Drain: each bin should include a drain hole with watertight plug.
    - Identification and marking: bins should meet all relevant clauses of ANSI 245.30-1999, or equivalent, and have a ribless, seamless decal area on the front of a size not less than 15 cm by 25 cm for affixing the governorate logo and the customer service telephone number of the contractor. In addition, each container should be labeled illustrating the materials to be contained, prominently in both Arabic and English letters a minimum of 8 cm in height.
    - Warranty: should be a minimum of 5 years on materials and workmanship on all container parts (not prorated).

2. **Distribution:** The contracting agency needs assurance from the contractor that storage containers will be delivered to service users in a timely and cost effective manner. To accomplish this goal the contractor should be required to submit a distribution plan with the company's tender offer for any containers that the company is to provide. The requirement should specify the time period in which all containers are to be delivered, allowing a reasonable amount of time for delivery, but not too far in advance of the date that collection service is scheduled to start. The contractor should be required to establish the location of bins in cooperation with the customers during the preparation period. The contractor should be required to distribute bins no later than 10 days before the start of the operations period.

3. **Maintenance:** To ensure the preservation and long life of storage containers and to minimize customer inconvenience, the contracting agency should require that the contractor monitor, control, sanitize, and otherwise maintain them over the life of the contract. Bins should be washed at least once every 3 months and rollout carts should be washed at least annually or according to the schedule and plan submitted by the contractor with his or her tender offer.

4. **Ownership:** To provide added incentive to maintain bins and other containers at the highest practicable level, and to reduce potential liability to the governing body, ownership should remain with the contractor. The governing body should be given the option to purchase the containers at the end of the contract period at a price to be specified in the service contract.

5. **Repair:** The contractor should be held responsible for repair of bins including lids and hinges, wheels, and axles, and all parts essential for the safe and efficient dumping of C&D stored in the bin. The contractor shall repair or remove and deliver a replacement bin within a specified time after notification by the customer of the need for repair.

6. **Replacement of Damaged Bins:** Some bins will need to be replaced from time to time over the contract period due to irreparable damage or theft. The contractor should be required to replace a damaged container within a specified time period, and at his or her own expense, any container that has been removed from its designated location or that is not fully functional and cannot be repaired.

## C&D Collection Personnel

To ensure that the contractor trains and deploys collection personnel in a manner that meets all of the contracting agency's economic, technical, health, safety, environmental, and aesthetic performance criteria, the RFT should contain minimum technical requirements that address each of the personnel-related concerns described below.

1. **Competence and Skills:** It is in the interest of the contracting agency and the public to ensure that the contractor employs personnel that are competent and skilled for their particular job position. This can be conveyed to the contractor through a minimum technical requirement that requires the contractor (including any subcontractors) to only utilize management and administration staff, field supervisors, drivers, and laborers that have met certain training requirements appropriate for their respective trades, e.g., in collection and processing of C&D respectively.

2. **Demeanor:** The collection personnel employed by the contractor will have considerable contact with those who use and provide the funding for the service. Long-term support for the service will be far more dependent upon the demeanor of the field personnel than on the performance of the contractor's upper management. Therefore, it is essential that the contracting agency convey the importance of worker demeanor and public diplomacy to the contractor through a minimum technical requirement that requires workers be trained by the contractor to maintain positive interaction with customers, residents, business owners, and governorate representatives.

3. **Driver Training and Licenses:** Collection vehicles may be large and hard to maneuver, thereby posing a potential danger to public safety if not operated by a well-trained and experienced driver. To minimize the risk to the public all drivers of collection vehicles should be required to carry valid Egyptian licenses appropriate for the class of vehicle that they are driving. In addition, the contractor should be required to certify that all drivers have been provided training appropriate to equip them with the skills needed to safely operate collection vehicles under the local conditions.

4. **Field Supervision:** To facilitate governorate communication with the contractor and to ensure adequate management of all collection personnel in the field it is essential that a minimum ratio of supervisors to work crews be specified. The contractor should be required to provide the names of all field supervisors in writing to the contract administrator. Finally, the field supervisor should be required to be present in his assigned area of responsibility at all times that crews are working, and have radio communication with the contractor's office and all collection vehicles under his or her supervision.

5. **Uniforms and Safety Equipment:** Requiring the contractor to provide uniforms and safety equipment for all collection, processing, and/or disposal personnel has the multiple purposes of protecting worker health and safety, minimizing direct contact with waste, ensuring worker cleanliness, and providing a means of projecting a positive image of the service to the public. Thus the contractor should be required to provide all employees with a specified number of uniforms, hats, gloves, work boots, reflective vests, and other protective clothing adequate to maintain their appearance, health, and safety. Processing facility personnel that are directly involved in sorting of materials should also be equipped with ear protection, air filtration masks, and puncture resistant gloves. All uniforms and safety equipment should be subject to review and approval by the contracting agency.

## Manner of Collection

The minimum technical requirements should include a section addressing collection practices to ensure that the contractor conducts all collection activities in compliance with the service specifications and in a manner that does not negatively impact the general public. The section on C&D collection practices should specify the minimum technical requirement listed below.

1. **Access to Private Property:** With the exception of providing collection services at the specified location(s), the contractor's employees should not be allowed to trespass or litter, cross property to adjoining premises, or meddle or tamper with property that does, or should, not concern them.

2. **Compliance with National Laws and Local Ordinances:** The contractor should be required to comply with all national laws and governorate ordinances including, but not limited to, those relating to obstructing streets, keeping passageways open, and regulation of waste collection and transportation.

3. **Conditions for Not Providing Service:** In those instances where the customer does not comply with service user requirements, the contractor should not be obligated to provide service. However, in every such case, the contractor should be required to leave a notification form specified by the contracting agency (non-collection notice) that informs the resident or business of the exact reason why service was not provided. In addition, the contractor should be required to report all such instances of user non-compliance to the contracting agency.

4. **Fees and Gratuities:** The contractor should not permit any employee or subcontractor to offer any service beyond the scope of this contract, or to solicit or accept, either directly or indirectly, any compensation or gratuity for services that are included in the scope of this contract.

5. **Placement and Usage:** The Governorate should make C&D waste generators responsible for placing C&D into bins provided by the contractor. The contractor should not be required to collect any C&D that is not placed in a bin, provided that the contractor leaves a non-collection notice.

6. **Property Damage:** Maneuvering large collection vehicles in heavy traffic and the negotiation of narrow roads create significant risk of damage to public and private property. To minimize this risk, the contractor should be held responsible for all costs associated with the repair and replacement of damaged property of any kind that can be ascribed to the actions of its equipment, employees, or agents. Moreover, collection crews should be required to immediately report any incident that might have caused damage to third party property to the field supervisor, who shall in turn inform the customer and contracting agency within 8 hours of such occurrence.

7. **Public Safety and Convenience:** To minimize safety hazards, inconvenience, and annoyance of the general citizenry it is important for the contractor to conduct work without disturbing the public. To achieve this objective the contractor should be required to take all practicable steps to minimize obstruction to pedestrians and motor vehicle operators during the performance of all aspects of the C&D service.

8. **Scavenging:** C&D collection, processing, and/or disposal employees will be tempted to scavenge recyclable materials that they collect. Scavenging reduces compliance with productivity and diversion goals, is dangerous, and projects a negative image of the job and the contractor. Require the contractor to forbid any employee from placing any C&D materials inside or outside collection vehicles except in the cargo area of the vehicle. Moreover, require the contractor to prohibit collection crews from offloading any materials while on collection routes or during transfer of materials to designated facilities.
9. **Spillage:** Materials spilled and not picked up by the contractor's collection crews sends a negative message to the public regarding the governorate's commitment to high quality service. While the contractor should not be responsible for cleaning up material around any of the storage containers when it is placed there by the customer, the contractor must be held responsible for removing any spillage of C&D materials that occurs due to the action of the contractor's collection equipment and/or personnel.

10. **Street Usage Rights:** The contractor should be granted the right to use the streets for the purpose of providing C&D collection services specified in the contract, but should not be granted exclusive use of such streets. The contractor must observe all local ordinances relating to obstructing streets, keeping passageways open and protecting same, and obey all laws and ordinances controlling or limiting those engaged in C&D service provision. When the contractor's vehicle blocks the passage of other vehicles, the contractor's vehicle should be required to pull aside at the first opportunity and allow waiting vehicles to pass.

## C&D Landfill Design/Construction Requirements

The minimum technical requirements should include a section addressing the design and construction requirements to ensure that the contractor includes all disposal site elements in compliance with the service specifications and in a manner that does not negatively impact the general public. The section on C&D disposal site design/construction should specify the minimum technical requirements desired by the contracting agency. The specifications should allow the contractor flexibility to use his or her experience to provide cost effective solutions. Issues to be addressed in the minimum technical requirements include:

1. **Construction Phasing Plan:** For each phase of the C&D landfill, the contractor should be required to prepare and present engineering drawings to the project administrator for review and approval. The contractor should be informed of the contracting agency's requirements for the appropriate engineering drawings showing cell construction details including profile of the cell, leachate collection pipes, lateral drainage layers, perimeter roads, and access roads.

2. **Design Drawings:** The contractor should be responsible for preparation of the final C&D landfill design and engineering drawings during the preparation period. At a minimum the contractor should be required to provide the following engineering drawings to the governorate:

    - Location and vicinity map.
    - Site boundary survey.
    - Site layout with topographic contours.
    - Construction phasing plan.
    - Excavation and grading plan.
    - Cell construction details.
    - Surface water management plan.
    - Final cover contours.
    - Construction details.
    - Cross-sections.

3. **Final Cover:** The final cover requirements for a C&D landfill are very site specific. The contracting agency should inform the contractor of its expectations regarding final use of the property and if necessary a minimum specification should be required for the type of material in the final cover and for the final contours for the landfill. The contractor should be required to place final cover on the C&D landfill. The contractor should be responsible for developing a cover management plan and calculating that sufficient cover material is available on site for continued landfill operation, as well as closure.

4. **Office Building:** The contractor should be informed whether an office building would be required for landfill management and supervisory staff. The following requirements should be considered for an office area.

    - Office for the landfill manager.
    - Office to accommodate working space and desks for contract monitors.
    - Office to store landfill drawings and records.
    - Washrooms and shower area.
    - Bathroom facilities.
    - Lunchroom for employees.
    - First aid station.
    - Visitor reception area.

5. **On-Site Utilities:** The specifications should inform the contractor or his or her responsibilities for design and construction of required on-site utilities including the following:

   - Water: The facility should be equipped with potable drinking water as well as water for fire fighting and dust mitigation.
   - Electricity: The facility should be equipped with sufficient electrical capacity to power all electrical equipment located on the site.
   - Sanitary Facilities: The permanent office building should be equipped with a shower area, washrooms, toilets, and a change area to handle all landfill employees.

6. **Preliminary Landfill Design, Construction, and Operations Plan:** The contractor should be required to provide a preliminary design, construction, and operations report in the draft work plan. The requirements for the report should include the following information in the form, preferably, of a narrative description, with preliminary design drawings:

   - Executive summary including descriptions of the design, construction, phased operation, and closure of the C&D landfill.
   - Design criteria for construction of the C&D landfill including landfill volume and capacity.
   - Daily and annual design capacity.
   - Design assumptions for waste volume and final cover requirements.
   - Calculations indicating total landfill volume for the ultimate site capacity.
   - Scalehouse operation procedures and descriptions of the data collection and management system.
   - Description of the site security system.
   - Preliminary facility and equipment maintenance schedules.
   - Animal vector management plan.
   - Cover management plan.
   - Dust management plan.
   - Fire control plan.
   - Landfill construction and quality control plan.
   - Surface water management plan.
   - Waste monitoring plan.
   - Noise control measures.
   - Contingency plans detailing corrective or remedial actions to be taken in case of environmental contamination or other emergency events.
   - Closure plan.
   - List of required permits and schedule for obtaining permits.

Conceptual drawings should specifically include the following information:

   - Bottom of excavation.
   - Final cover and elevation.

7. **Quality Control:** The contractor should responsible for monitoring quality control over all suppliers, services, site conditions, and workmanship. The contractor should be required to prepare a landfill construction and quality control plan that describes the quality assurance and quality control measures that will be employed during construction. The contractor should be required to submit the plan to the governorate for approval.

8. **Roads:** The access road design requirements should be described. For example, it should specify whether one or two-way traffic is preferred to and from the C&D landfill. The roads should be designed to accommodate all vehicle types expected at the landfill. The roads should be designed and constructed to include ditching and drainage.

9. **Scalehouse:** The C&D landfill design should include a scalehouse located at the entrance to the site. A scalehouse specification should require a minimum number of platform truck scales and note whether a computerized system is required for billing and tracking incoming waste. The platform scales should have the capability of accurately measuring tare and net weights of the range of vehicles expected at the landfill.

10. **Separation Barrier:** The C&D landfill design requirements should include provisions for a minimum separation between the maximum groundwater elevation and bottom of the landfill.

11. **Site Fencing and Signage:** The minmum technical requirements should require the contractor to provide fencing for the he entire boundary of the site. The contractor should post a sign(s) at the site entrance identifying the site name, address, telephone number, and the contractor's name. The sign(s) also should list acceptable and unacceptable wastes, hours and days of operation, and the 24-hour telephone number of the customer service office.

12. **Site Life:** The contractor should be directed to design and operate the C&D landfill in a manner that will maximize the life of the C&D landfill site.

13. **Site Plan:** The contractor's draft work plan should include a site plan with a minimum scale designated by the contracting agency. The site plan should include a vicinity map that shows the location, access road, and street address for the facility. The site plan should include the following:

    - Existing and final elevation contours.
    - Property boundaries.
    - Access roads.
    - Perimeter fencing area and entrance gates.
    - Major structure locations including the scalehouse.
    - Drainage facilities.
    - Maintenance yard.

14. **Surface Water Management:** The contractor should be required to design the C&D landfill to prevent run-on of precipitation into the landfill's working face and run-off of precipitation from the working face. The contractor should be required to provide calculations demonstrating that any precipitation that may fall onto the landfill footprint, or any other areas of the site used for waste holding or transfer, shall not leave the site.

## C&D Landfill Operation Requirements

To ensure that the contractor operates a disposal site in the manner required, the minimum technical requirements should describe in detail what is expected. These specifications should provide sufficient detail to assure that the contractor operates the disposal site(s) in a manner that meets all of the contracting agency's economic, technical, health, safety, environmental, and aesthetic performance criteria. The requirements should allow flexibility for the contractor to operate in accordance with acceptable industry practices and to take advantage of the contractor's knowledge and experience. The RFT should contain minimum technical requirements that address each of the operational concerns described below.

1. **Animal Vector Control:** The contractor should be required to prevent the presence of livestock or other domestic animals on the site, and should take measures to discourage and minimize the presence of rodents, birds, insects, feral animals, and any other potential disease vectors.

2. **Dust Management:** The contractor should be required to incorporate measures to mitigate dust generation during landfill operation.

3. **Equipment:** The contractor should be responsible for procurement and maintenance of all equipment sufficient to effectively operate the landfill, including back-up equipment.

4. **Facility and Equipment Maintenance:** The contractor should be responsible for establishing a scheduled equipment maintenance program and for conducting routine maintenance on all equipment throughout the duration of the contract. The contractor should be required to maintain all facilities in a manner that will not negatively impact daily operations, site security, or worker health and safety. The contractor should be required to maintain the following items in good working condition capable of performing their intended function:

   Buildings and other structures including, but not limited to, perimeter fencing, gates, scalehouse, paved surfaces, un-paved surfaces, drainage structures, utilities, and truck scales.

Mobile equipment including, but not limited to, earth moving equipment, graders, front-end loaders, sweepers, dump trucks, water transport trucks, and fire fighting equipment.

5. **Final Cover:** The contractor should be given a schedule for the placement of final cover, such as: after any area of the C&D landfill has reached its final elevation, and no more waste will be placed on the area, the contractor should place the final cover.

6. **Fire Suppression:** The site should be equipped with appropriate fire fighting and fire retardant equipment to suppress any fires on the site. All buildings located on the site should be constructed of fire resistant/retardant materials and should be equipped with fire extinguishers. The specifications should clearly state the contractor's responsibilities.

7. **Groundwater Monitoring:** Require that the contractor prepare a groundwater management plan that describes in detail the proposed location of the groundwater monitoring wells, as well as the proposed well installation and groundwater collection and analytical procedures, and submit the plan to you for approval. The contractor should be required to prepare, and provide to the governorate, boring logs and well construction details for each of the monitoring wells. The contractor should obtain and analyze groundwater samples from these wells quarterly or on an alternate schedule approved by the regulatory agencies. The contractor should be required to report the results of the field and laboratory analyses to the project administrator. All groundwater collection and analytical procedures should be conducted in accordance with the governorate-approved groundwater management plan.

8. **Hours and Days of Operation:** The specifications should provide direction on when the C&D landfill must be open for operation. With governorate approval, the contractor should be allowed to provide an alternate schedule.

9. **Landfill Closure:** The contractor should be responsible for closure of the C&D landfill. The contractor should implement all closure activities in accordance with the governorate-approved closure plan.

10. **Litter Control:** The contractor should be required to collect and properly dispose of litter inside the site and along the access road to the landfill including any wind blown litter originating from the landfill or from traffic into the landfill. The site should be required to have appropriate fencing to prevent wind blown litter from leaving the site. On a daily basis, designated contractor personnel should be required to inspect the entire perimeter of the facility and collect all litter within the first 50 m outside the site boundary and along the access road. The contractor should keep the access road, entrance area, office area, and the scalehouse area free from litter at all times.

11. **Regulatory Compliance:** The contractor should be required to construct, operate, and close the C&D landfill in compliance with all permitting and environmental regulations and health and safety regulations at all times throughout the duration of the contract. In case of non-compliance, the contractor should be directed to notify the governorate and the appropriate regulatory authority within 24 hours.

12. **Safety and Communications:** The contractor should be required to develop a site-specific safety and communications plan. All contractor staff should be required to receive training in health and safety and emergency response procedures. The contractor should be required to provide telephone service at the site to call for emergency medical assistance in the event of a serious worker injury.

    The contractor should be required to stock and provide emergency first aid kits for use in the event of an injury. The contractor's employees should be required to wear, personal protective equipment including, but not limited to, steel toe shoes, hard hats, visual safety vests, and dust masks. The contractor also should be required to provide hard hats and dust masks for site visitors. The contractor should conduct a monthly safety inspection of the entire facility and inspect the condition and upkeep of all required personal protective equipment in use and in storage.

13. **Scalehouse:** The contractor should be required to weigh all incoming collection vehicles prior to dumping their waste load. Vehicles also should be weighed after emptying their loads if a previous certified empty weight has not been established for that vehicle. At the scalehouse, vehicles should be directed utilizing a manual flagging system or an automated traffic signal. The contractor should be required to ensure that vehicle queuing time at the scalehouse is kept to a minimum, especially during peak delivery times.

    The contractor should be responsible for timely scheduled maintenance and calibration of the platform scales throughout the term of the contract. All maintenance and calibration procedures should conform to manufacturer specifications.

14. **Scavenging:** The contractor should forbid all employees, sub-contractors, or the general public from informally scavenging any waste delivered to the C&D landfill. The contractor may be given the right to isolate and sort out C&D materials items for recycling from the delivered waste. Any contractor activity associated with on-site sorting or recycling should be confined to a dedicated area of the site located away from the landfill face. Salvaged and sorted items should be required to be removed, sold, or landfilled within 2 months of recovery. The contractor should not be allowed to permanently store any waste or recovered waste items at the site.

15. **Security:** The security of a C&D landfill should be the responsibility of the contractor. The requirements should include provisions for site closures for holidays or for any other reason, along with the entrance gate procedures to prevent vandalism and the uncontrolled dumping of waste at the landfill.

16. **Source of Waste:** The contract specifications should very clearly state any limitations on the source and type of waste that a contractor can, and cannot, accept at a C&D landfill. The contractor should be required to dispose only acceptable C&D waste at the C&D landfill, and should not dispose any unacceptable waste at the C&D landfill. Unacceptable waste generally includes municipal solid waste, industrial waste, treated medical waste residue, hazardous waste, chemical liquid wastes, and radioactive wastes.

17. **Staffing and Management:** Staffing, at a minimum, should include the following:

    - Landfill Manager.
    - Shift Supervisors.
    - Scalehouse Operators.
    - Equipment Operators.
    - Mechanics.
    - Laborers.

18. **Waste Monitoring Plan:** The contractor should be required to implement a waste monitoring plan approved by the governorate to inspect loads to detect and prevent the disposal of unacceptable waste. The plan should include:

    - Inspection frequency.
    - Inspection personnel.
    - Identification of an inspection area located away from the tipping area.
    - A training program for the facility employees on the identification of unacceptable waste.

19. **Waste Spreading and Compaction:** The contractor should be required to spread and compact waste received at the C&D landfill. The waste should be placed in layers not to exceed 60 cm in depth. All C&D materials should be spread in uniform layers to eliminate unfilled voids.

20. **Weighing System:** The contractor should be required to maintain a system for classifying, weighing, and recording all incoming waste, and specific vehicle information. This information should be classified in the following categories:

    - C&D.
    - Accumulated waste.

- Vehicle type.
- Vehicle gross and tare weight.
- Vehicle license number or truck number and contractor.

## Customer Service and Complaint Handling

The contractor should be required to offer a system that facilitates receiving, recording, and resolving inquiries and complaints from all categories of service users. To optimize customer usage the system must be widely publicized and easy to use. To ensure the implementation of a system that meets these objectives, the contracting agency should establish requirements for each of the following related issues.

1. **Communications Equipment Requirements:** The contractor should be required to equip the customer service office with enough telephone lines to be able to answer all calls in less than 1 minute, even during peak hours. The office should be equipped to transmit complaints to field supervisors through the use of two-way radio or cellular telephone communications. The office should also be equipped with facsimile equipment to facilitate transmission of written communication with the organization responsible for contract administration.

2. **Complaint Handling:** The ability and commitment of the contractor to expeditious resolution of all complaints is essential to maintaining the financial and behavioral support of service users. As a first step the contractor should be required to record in a bound book all complaints, noting the name and address of each complainant, date and time of complaint, nature of complaint, and nature and date of resolution. The contractor should also be required to compile a summary statistical table of the complaint record in a form satisfactory to the contracting agency, which should reserve the right to examine it at any time.

3. **Complaint Resolution:** The logistics and timelines associated with resolution of complaints need to be specified in the minimum technical requirements. The contractor should be required to respond to all customer complaints within, at most, 12 hours. If a complaint involves a failure to collect C&D materials from any customer as required in the contract, the contractor should collect the material in question within 12 hours of notification, provided it has been prepared for collection in accordance with the service user requirements.

4. **Hours of Service:** To maximize customer convenience the customer service office should be open during all hours that calls might be expected regarding the service. If the contractor is providing service during night time hours, then the office should be staffed 24 hours on each day that service is provided. Fewer hours might be acceptable if all service is provided within one or two daytime shifts only. However, it is better to err on the side of too many rather too few hours in order to maintain customer support and satisfaction.

5. **Staffing:** The office should be staffed with a number of trained personnel adequate to ensure that customers are able to reach a qualified customer service representative within 2 minutes of calling.

6. **Unresolved Complaints:** Provisions also need to be prescribed in the event of reports from contracting agency monitors or customers that a complaint has not been resolved to the customer's satisfaction. In this case, the contractor should submit a detailed report outlining the nature of the complaint and the resolution or actions taken to resolve the complaint. If, in the opinion of the contracting agency the proposed resolution or actions taken are insufficient to satisfactorily resolve the claim, it should require the contractor to carry out a process to satisfactorily resolve the complaint.

## Reporting and Records Requirements

Requiring the contractor to prepare and submit monthly reports that address all aspects of C&D collection, processing, and disposal operations is the best way to maintain complete and up-to-date working knowledge of contractor activities and performance. On-going review and analysis of these reports provides an ideal mechanism for both the contractor and the contracting agency to identify trends and potential problem areas and to expedite remedial measures that improve overall service.

1. **Monthly Operations Reports (MORs):** The contractor should be required to submit Monthly Operations Reports to the governorate project administrator within 15 days of the end of the month being reported on. The monthly operations report for C&D collection should include, at a minimum, the following information:

    - Total number of C&D collection vehicles and personnel used daily.
    - The average number of C&D generators and the number of new C&D generators added during the month.
    - Total tons of C&D collected each day.
    - Number of notices of non-collection left and name and location of C&D generators where notices were left.
    - Total tons of C&D waste offloaded at designated processing, transfer, and disposal facilities that month.
    - Total tons of C&D diverted from disposal through recycling or other methods.
    - Total tons of C&D disposed.
    - Volume of landfill used.
    - Percent of total airspace used.
    - Areas of the landfill receiving waste.
    - Areas of the landfill receiving final cover.
    - Results of groundwater or other environmental monitoring conducted.
    - Storm events, if any and an assessment of the surface water management system's performance.
    - Remedial actions taken, if any.
    - Specific equipment problems during that month.
    - An updated list of equipment and vehicles bought or disposed by the contractor.
    - Injuries or other labor problems during that month.
    - Number of complaints received monthly summarized by type and source.
    - Resolution for each complaint.
    - An updated list of names of all supervisory personnel.
    - Description of problems encountered by the contractor and proposals for increasing service performance and achievement of service objectives.
    - A description of all cases of public and private property damage and personal injury that have occurred while providing C&D services, including a copy of the accident or incident report filed with the contractor or with the appropriate authority.
    - A description of any violations of applicable laws and ordinances and their dispositions.

    The monthly operations report for C&D disposal operations should include, at a minimum, the following additional information:

    - Total quantity of solid waste landfilled during the month based on scalehouse records by type and tonnage.
    - Volume of landfill used.
    - Percent of total airspace used.
    - Areas of the landfill receiving waste.
    - Areas of the landfill receiving final cover.
    - Environmental monitoring results, and remedial actions taken, if any.
    - Storm events, if any, and an assessment of the surface water management system's performance.
    - Specific equipment problems during that month.
    - An updated list of equipment and vehicles bought or disposed by the contractor.
    - Staffing issues or changes.
    - An updated list of supervisory personnel at the C&D landfill.
    - Injuries or other labor problems during that month.
    - Description of any non-compliance or violations of laws or regulations and their resolution.
    - List of complaints during the month and their resolution.

2. **Annual Operations Reports (AORs):** The contractor should be required to submit an Annual Operations Report to the governorate project administrator within 30 days of the

end of the year being reported on. The annual operations report content should include all of the items listed in the monthly operating report, as well as proposals for contract changes that will increase operating efficiency. All monthly data shall be displayed graphically by month, and monthly data shall be summarized in annual totals.

3. **Availability of Records:** All records specified in this article shall be available for inspection by the project administrator or designated representative during all site operating hours, and copies shall be submitted with the monthly operating reports.

4. **Form of Records:** The form of all records specified in this article shall be subject to approval by the governorate.

5. **Misreporting:** The contractor should be notified in the technical specifications that the inclusion of any materially false or misleading statement, or representation of such in any report submitted by the contractor, may result in the termination of the contract, and the imposition of penalties.

## Performance Standards

Performance standards tell the bidders what the minimal acceptable levels of performance will be. Each service specification and minimum technical requirement needs a corresponding performance standard that is quantifiable. This provides a legitimate means for the contracting agency to evaluate contractor compliance through monitoring service performance and comparing it to the specified standard.

It is important that performance standards be written in a way that the contractor can easily understand them so that they will know how they will be measured by the organization responsible for administering and monitoring the contract.

### Example Performance Standards

***Fire Control***
*"No landfill fire shall be allowed to burn for more than 1 hour before fire suppression activities are initiated."*

***Distribution Schedule***
*"The contractor shall deliver a minimum of 98 percent of all C&D bins according to the specified schedule."*

***Dust Control***
*"There shall be no more than five incidences of excessive dust reported at the landfill during any 30 day period. All unpaved on-site roads in use shall be watered a minimum of four times a day. Other dust suppression activities shall be undertaken within 1 hour of observed occurrences of excessive blowing dust."*

***Effective Service LIfe***
*"No more than 0.5 percent per operations year of all C&D waste storage bins put in service shall require replacement of any component parts that fail in materials or workmanship for a period of 5 years after installation."*